Remarks

Claims 1 and 21-30 are directed to the methods of the invention, while claims 12 and 31-38 are directed to apparatus employing the invention. In the following review of the prior art, in order to avoid unnecessary repetition, each method claim will be considered together with its corresponding apparatus claim.

The examiner's careful outlining of the pertinent parts of the two principal citations and their application to the previous claims is appreciated.

US patent No. 3,902,857 (Vander Mey et al) is cited against most of the previous claims under 35 U.S.C. 102(b). Vander Mey et al teaches a thin film reactor in which an organic liquid is delivered via pipes 36 and 38 to surfaces 20 and 22 of a spinning disc 12, so that under centrifugal force the liquid spreads on the surfaces in the form of thin films. The disc is enclosed within a chamber and a gaseous reactant is introduced into the chamber via an outlet section 44 disposed between the two surfaces. This structure which is common for all spinning disc reactors is specified in the initial subparagraphs of new Independent claims 1 and 12, so that the subsequent method steps and structure that distinguish the invention can be defined with the necessary clarity. All of the other claims are dependent either directly or indirectly upon their corresponding independent claim 1 or 12, and therefore include all of the limitations of that claim and should be allowable therewith.

Thus, all of the new claims specify directly or indirectly that the reactor surface 20 onto which a first reactant has been fed in the form of a thin film, must have a retaining surface 40 closely spaced from the reaction surface, forming a reaction passage between them, the two surfaces being movable relative to one another to apply shear to the material passing between them. Such a step and the necessary structure are recited in former method claims 7-9 and apparatus claims 17-19 and are fully supported by the disclosure. No such method or apparatus, or any equivalent thereof is shown, or to be inferred, from the Vander May et al disclosure.

All of the claims also require that second, third, etc. reactants that are provided are fed to the reactor surface in the form of a respective thin film, which upon such feed will immediately be subjected to continuous and uniform shear at its intersection

with the preceding thin film or combination of preceding films. Such a method step and structure are recited directly or indirectly in all of the former claims. Once again no such method or apparatus, or any equivalent thereof is shown, or to be inferred, from the Vander May et al disclosure, the entry means for the reactants of which introduce them in the form of jets. These distinctions from the disclosure are believed to be completely adequate for the claims to be inventive and patentable.

U.S. Patent No. 6,858,189 (Ramshaw et al) is cited against all of the claims under the provisions of 35 U.S.C. 102(e). The contribution of Professor Ramshaw and his colleagues to the field of spinning disc reactors is fully acknowledged in the specification of this application by paragraphs 0006 through 0010, together with numerous references to prior patents and publications in which his name appears, and this U.S. patent is but one example of his work in which, as pointed out by Examiner Bhat, the prime concern is to provide surfaces of special configuration which he believes will facilitate the reactions taking place thereon. In this particular disclosure the surface of the disc, which does not have an accompanying spaced parallel retaining surface, as is required by the present invention, is provided with circumferential grooves (see Figure 8 as referred to by Examiner Bhat) into which the reactants are delivered for centrifugal force to convert into thin films, and which then travel together over the surface. This is to be contrasted with the present invention in which the second and subsequent films are delivered into the reaction passage already in the form of a thin film or separate films, so that the defined interaction can take place.

The office action draws attention to Column 2, lines 44-61 of Ramshaw et al, and the appropriate extract from this part of the disclosure is lines 62-67, as follows:-

"Any suitable feed means may be provided to feed the at least one reactant onto the rotating surface. For example, the feed means may comprise a feed distributor in the form of a "shower head", a "necklace" of outlets or a single, preferably adjustable single point introduction such as "hose-pipe type" feed means."

Clearly this does not in any way constitute a disclosure of the specific feeds means required by the claims of this application, or a disclosure that would render such claims obvious. The specific description at column 9, line 44 through column 11, line 30 adds nothing more pertinent to this disclosure.

The reference is further cited as anticipating the use of heat exchange means for the spinning surface, and for polishing the surface, and these features are not claimed in the revised claims, so that the reference is no longer pertinent in this respect.

The remaining prior art of record is cited as "background material" only pertinent to this disclosure, which I believe is emphasised by the following brief reviews.

US No. 4,627,803 (Umetsu) discloses a vessel in which acetylene can be polymerised, the vessel having at its bottom a spinning disc member which is used to form a thin film of the necessary catalyst.

EP No. 1464389 (Ramshaw et al) shows a spinning disc reactor in which reactant is fed to the centre from which it flows over the surface, while a gaseous reactant is drawn over the surface by an extractor fan positioned above the surface,

US No. 6,482,960 (Brechtelsbauer et al) simply discloses a method of heating or cooling the operative surface of a spinning disc reactor.

GB No. 2,108,407 (VEB Leuna-Werke) shows a special form of spinning disc reactor in which a spinning disc and a widely spaced stator have meshing circles of teeth forming a passage between them and with reactant introduced through circumferentially spaced pipe inlets in the stator.

US No. 4,549,998 (Porter et al) discloses a liquid-gas contactor comprising a stack of axially spaced plates which rotate together while a gas is fed into the spaces between them through a single large inlet.

EP No. 0,499,362 (Tioxide Group Services) describes a process in which materials to be decomposed are spread out over the surface of a disc coated with a catalyst to facilitate exposure to ultraviolet light.

PGPUB 2003/0161767 (Ramshaw et al); PGPUB 0236039 (Jachuck); USPUB 2004/0241430 (Jachuck et al) and USPUB 2005/0158220 (Ramshaw et al) are all examples of specific developments of Professor Ramshaw's group and add nothing to the disclosure of those in US Patent No. 6,858,189 specifically discussed above.